

The Examiner has rejected Claims 1-3, 6-13 and 19-22 under 35 USC §1112 as containing subject matter not supported by the specification. The specification and the relevant claims have been amended to overcome this rejection.

Claims 1 and 19 have been amended in order to more specifically define the invention and to more clearly distinguish over the cited references in a sincere effort to place the case in condition for allowance. The claims have been amended to define the substrate as a "substrate on which said sensor assembly is formed" in place of a "primary support substrate" which the Examiner objected to as not being supported by the specification. No new matter has been introduced. The claims are now clearly supported by the specification as filed and the claims clearly distinguish over the coating structures of Brown et al and Europe.

Applicant also wishes to point out that the term "substrate" is a term of art in the electronics field and does not include the coating structures of Brown et al and Europe. This application and the cited references are directed to one of ordinary skill in the relevant art, who would be a designer or engineer of electronic circuits. Enclosed is a copy of a page showing the definition of "substrate" from the *Encyclopedia of Electronics* by McGraw Hill which shows the meaning to one of ordinary skill in the art.

Claims 6 and 20 have been amended in order to overcome the 112 rejection by specifying that the "third cell which reduces the amount of encasing material adjacent the flow channel". The specification has also been changed back to its original statement. The third cell and its purpose is discussed at page 35, lines 14-16. To further explain, the housing material will absorb some moisture from the sample regardless of the material from which it is made. Therefore, the third cell functions to reduce the mass of the encasement and the amount of moisture absorbed from a sample.

The Examiner has rejected Claims 1-3, 6-13 and 19-22 under 35 USC §103 as being unpatentable over Betts in view of Knudson et al., Brown et al. with or without Europe. Applicants traverse the Examiner's rejection for the reason there is no teaching or suggestion in the references for combining them, and even if combined they would not provide the invention as now claimed. First of all, neither one of Betts nor any of the other references or any combination of them disclose or suggest "a plurality of sensors having a diameter between about 0.046 to about 0.078 inch deposited on said planar surface of said first side of the substrate" as defined in claim 1. Neither one nor a combination of discloses "subminiature through holes having a diameter in a range of about 0.002 - 0.006 filled with electrically conductive material", as further required by claim 1.

Knudson et al. at col. 5, line 32 discloses that "electrode body 14 was a carbon disc of 2.032 mm diameter" mounted in an enlarged recess in the substrate and not "on the planar surface" as claimed. The Figs. 9A and 9B electrode of Knudson et al. is disposed in an enlarged 2.032 mm through hole in the substrate and not "on the planar surface" as claimed. Knudson et al. does not disclose the diameter of the through hole 20 or pin 18 in the through hole. The illustration clearly shows it to be at least two thirds (2/3) diameter of disc 14. Therefore the through hole is at least 1.3 mm, which makes it close to 1/16th of an inch, not 0.002-0.006 inch as claimed..

Brown discloses a construction like Betts and does not disclose subminiature through holes through a "substrate" and particularly does not disclose a through holes through a "substrate on which said sensor assembly is formed" as required by claims 1 and 19. Also he does not disclose a flow channel between an inlet and an outlet to allow analyte to pass through a housing over sensors. He discloses a solid state electrode fabricated using a screen printing system. A

primary supporting substrate 21 has a layer of silicon dioxide 22 on which an aluminum electrode 23 is deposited and over which a layer of silicon nitride 25 is arranged. There is no through hole through the "substrate on which said sensor assembly is formed" as required by claims 1 and 19. A hole in a protective layer does not suggest a through hole from a sensor on one side of a "substrate on which said sensor assembly is formed" to a conductor on the other side of the substrate. Furthermore, there is no suggestion or motivation provided in any of the references cited by the Examiner to provide such a subminiature thru-hole *directly under* the sensor in Betts.

Brown et al. at col. 6, line 53 discloses a 600  $\mu\text{m}$  via hole in a silicon nitride layer on a substrate, not through a primary supporting substrate as claimed. The term "substrate" has a definite meaning in the art, and does not include a coating on a primary supporting substrate. See enclosed *Encyclopedia of Electronics* by McGraw Hill and previously enclosed page 573 from the 1974 *Radio Shack Dictionary of Electronics*. The Examiner is not permitted to give a meaning repugnant to the usual meaning of the term. MPED 608.01(o).

Contrary to the Examiner's statement, Europe '639 does not disclose or in any way suggest through holes in a "substrate on which said sensor assembly is formed" as required by claims 1 and 19. It merely discloses apertures (perforations) 4 in a protective layer 2 of electrically insulating film to allow electrically conductive material 3 exposed apertures to create a microdisc array electrode. An electrode comprises multiple areas of the conductive material. There are no through holes in the primary supporting substrate as claimed.

The claimed subminiature through hole has many unexpected advantages including enabling forming an electrode in a single layer directly over the hole on the planar surface of the primary

forming an electrode in a single layer directly over the hole on the planar surface of the primary supporting substrate. It also enables the construction of compact and quick response sensor assemblies. Moreover, none of the secondary references suggest nor motivate one skilled in the art to provide a thru-hole *directly under* the sensors of Betts.

The applicants' invention is directed to an improvement over the Betts type sensor unit and particularly to a structure to provide a sensor which remains accurate over a relatively long period of exposure to electrolytes and blood samples, uses a very small sample size, detects the concentration of a number of different electrolytes and the partial pressure of a number of blood gasses all in a single analysis, and in which a blood sample may be heated very rapidly to a known stable temperature. To this end applicants' invention is defined by "a plurality of sensors deposited on a first side of the substrate; a plurality of electrical conductors deposited on a second side of the substrate; a plurality of subminiature thru-holes having a diameter in the range of about 0.002-.006 inches filled with electrically conductive material, each thru-hole disposed directly under a corresponding one of the sensors for coupling one of the sensors with one of the electrical conductors", as defined by claim 1 and with slightly different language in claim 19, which neither Betts nor any suggested combination of Betts and the other references disclose or in any way suggest.

In contrast, Betts is not concerned with the applicants' problem or their solution. He discloses that a patterned metallic layer 113 has metallic external leads 146-160 on the other side of the substrate 111, as stated at cl. 19, line 53-60. Moreover, Betts neither teaches nor suggests a subminiature thru-hole disposed directly under a sensor, as recited in Claim 1, more particularly he does not teach or suggest a subminiature through hole having the dimensional range of 0.002 - .006

inches. Betts has no need for the claimed construction and would not obviously benefit from it.

Claims 4 and 5 stand rejected under 35 U.S.C. §103 as being unpatentable over Betts in view of Knudson et al., or Brown et al. or Europe and Grubb. Applicants respectfully traverse the Examiner's rejection for the reasons as pointed out above with respect to claims 1-3, 6-13. None of the references cited teach or suggest the specified sensors on a planar surface of a primary supporting substrate or a subminiature thru-hole *directly under* the sensors. Furthermore, there is no suggestion or motivation in any of the references to combine them with Betts to provide a subminiature thru-hole *directly under* the sensor. Moreover, the elongated tubular electrode half cell of Grubb does not teach or suggest an electrode or sensor that can be mounted on a planar surface of a primary supporting substrate as claimed. Moreover, there is no teaching or suggestion of modifying the sensors of the Betts combination to provide the claimed invention.

Claims 14 and 15 stand rejected under 35 U.S.C. §103 as being unpatentable over Betts in view of Pace, et al. '978, Pace '410, Knudson et al., or Brown et al. with or without Europe and Buzza Applicants respectfully traverse the Examiner's rejection for the reasons as pointed out above with respect to claims 1-3, 6-13. None of the references cited teach or suggest the specified sensors or a subminiature thru-hole *directly under* the sensors as pointed out above. Furthermore, there is no suggestion or motivation in any of the references to combine them with Betts to provide a subminiature thru-hole *directly under* the sensor. Buzza does not disclose oxygen sensors that can be formed in the specified manner on the specified substrate. Moreover, there is no teaching of how or why one would provide a dome in a in a flow channel of the claimed encasement and substrate combination.

Contrary to the Examiner, Buzza does not teach a flow channel having a plurality of sensors

including an oxygen sensor and wherein the flow channel has a dome which increases the volume directly about the oxygen sensor. The dome at the end of a cylinder in Buzza doesn't suggest the claimed combination or modification. Moreover, there is no teaching or suggestion in any of the references for combining Buzza with them and modifying the passage of the Betts combination to provide the claimed invention including the dome over certain sensors.

Claims 16 and 17 stand rejected under 35 U.S.C. §103 as being unpatentable over Betts in view of Knudson et al., or Brown et al. with or without Europe and Pace '410 and Kuhn et al. Applicants respectfully traverse the Examiner's rejection for the reasons as pointed out above with respect to claims 1-3, 6-13, 14 and 15. None of the references cited teach or suggest a subminiature thru-hole *directly under* the sensors. Furthermore, there is no suggestion or motivation in any of the references to combine them with Betts to provide a subminiature thru-hole *directly under* the sensor. Moreover, there is no teaching or suggestion in any of the references for combining Buzza with them and modifying the passage of the Betts combination to provide the claimed invention including the dome over certain sensors. Additionally, there is no teaching or suggestion in any of the references for combining Kuhn et al. with them and modifying the Betts combination to provide the claimed combination including the claimed sensors and the further feature of a hematocrit sensor in the combination. The Examiner is treating applicant's claims as a catalog of elements and has employed hind sight reconstruction to pick bits and pieces from numerous separate prior art references to meet those elements.

Pace does not disclose leads on the other side of the substrate, and is even less pertinent that Betts. None of the references cited teach or suggest modifying Betts with Pace to place a subminiature thru-hole *directly under* the sensors for connection to leads on the other side of the

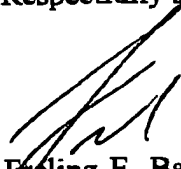
substrate. Furthermore, there is no suggestion or motivation in any of the references to combine them with Betts to provide a subminiature thru-hole *directly under* the sensor. The Examiner has chosen bits and pieces of the claimed combination from the prior art and put them together using impermissible hindsight construction in light of applicants disclosure.

A terminal disclaimer with respect to companion application S.N. 648,675 is submitted herewith.

It is believed that this application is now in condition for allowance and reconsideration is earnestly solicited.

No additional fees are due. Please charge any deficit or credit any excess to our Deposit Account No. 02-0460.

Respectfully submitted,

By:   
Pruling E. Baker  
Attorney for Applicant  
Registration No. 24,078

BAKER & MAXHAM  
Symphony Towers  
750 "B" Street, Suite 3100  
San Diego, California 92101  
Telephone: (619) 233-9004